

February 27, 1896.

Sir JOSEPH LISTER, Bart., President, in the Chair.

A List of the Presents received was laid on the table, and thanks ordered for them.

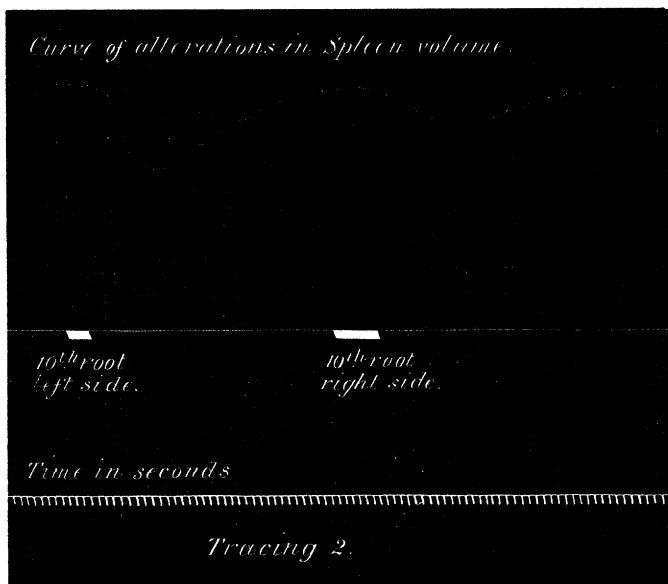
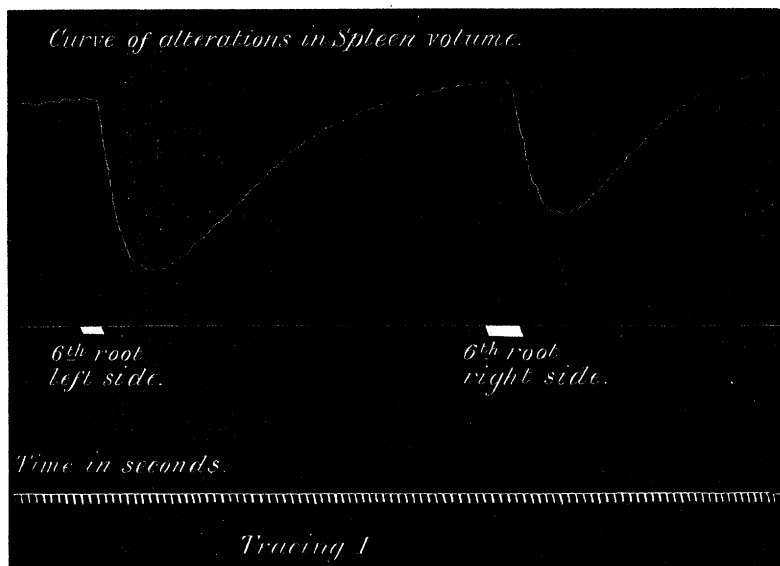
The following Papers were read:—

- I. "On the Spinal-root Connections and Ganglion-cell Connections of the Nerve-fibres which produce Contraction of the Spleen." By E. A. SCHÄFER, F.R.S., and B. MOORE. Received February 12, 1896.

(From the Physiological Laboratory of University College, London.)

We have investigated, in four dogs, the effects upon the spleen volume of excitation of the thoracic and lumbar nerve-roots. In all four cases the animals were fully anæsthetised, at first with chloroform and afterwards with morphia, and were curarised, artificial respiration being maintained in the usual way. The spinal cord was then exposed in the dorso-lumbar region, and the nerve-roots on both sides tied and cut close to the dura mater, the latter with the enclosed portion of cord being then entirely removed. The blood pressure in the aorta was recorded by a tube tied into the carotid artery and connected with a mercurial manometer, and the spleen volume was simultaneously inscribed by a tambour connected with the spleen plethysmograph (see preceding paper, p. 229).

The following are the results which we have obtained from excitation of the nerve-roots from the second postcervical to the fifteenth postcervical inclusive. In none of the four experiments did excitation of the *second* postcervical (second dorsal) pair produce any contraction of the spleen. In none of the four experiments did excitation of the *fifteenth* postcervical pair produce any contraction of the spleen. In three out of the four experiments a distinct contraction of the spleen was got on stimulation of all the roots on both sides from the third postcervical to the fourteenth postcervical inclusive. This effect was relatively smaller on stimulation of the third and fourth postcervical nerves and of the eleventh to the fourteenth postcervical than on stimulation of the intermediate pairs, the most marked effects being obtained from the sixth, seventh, and eighth pairs (compare tracings 1 and 2). In all cases the effect was



got, as already stated, from the nerve-roots of *both sides*, but with each nerve pair it comes out as an almost constant occurrence that a decidedly less marked effect is obtained with the same strength of stimulus upon the right side than upon the left. This is exemplified in the tracings.

In one out of the four experiments contraction of the spleen was not obtained by stimulation of the eleventh and twelfth postcervical pairs of nerve-roots, nor of the thirteenth root on the right side, although obtained with all the other nerve-roots from the third to the fourteenth postcervical inclusive. It is possible that this lack of effect may have been due to some accidental cause which we were unable to discover, or there may have been an individual peculiarity in the nerve distribution in this animal.

We have found that after intravenous injection of small doses of nicotine, the effect upon the spleen of stimulating the nerve-roots may entirely disappear, while stimulation of the splanchnics is still quite effective. We infer, therefore, that the nerve-fibres which produce contraction of the spleen have a cell station in the prevertebral chain of ganglia.

We have not obtained any evidence regarding the nerve-root origin of the dilating or inhibitory fibres which we have shown to pass to the spleen by the splanchnic nerves (see previous paper, p. 230).

#### *Conclusions.*

The muscular tissue of the spleen in the dog is innervated through an extraordinarily large number of nerve-roots, viz., from the third postcervical to the fourteenth postcervical inclusive.

The largest outflow, if we may judge by the amount of contraction produced, occurs from the fifth postcervical to the ninth postcervical inclusive.

Reasoning in the same way, the outflow is in each pair of nerve-roots larger upon the left than upon the right side, *i.e.*, it is not bilaterally symmetrical.

The outflowing fibres probably have a cell-connection in the main ganglionic chain of the sympathetic.

So far as we have been able to ascertain, there are no published observations bearing directly upon the subject of this communication. Dr. J. Rose Bradford attempted some years ago, in this laboratory, to determine the spinal-root connections of the spleen with the aid of Roy's oncometer, but he encountered considerable difficulty, and the results which he was able to obtain were inconclusive. He informs us, however, that he got contraction of the organ on stimulation of nerve-roots in the thoracic region on both sides, although the limits of the outflow were not decided, and that there was a tendency to greater contraction on stimulation of the roots on the one side than on the other.

## Note added March 9.

Since the above was communicated to the Society we have made, at the suggestion of Mr. Langley, some further experiments upon the action of nicotine, employing cats instead of dogs (since in his experience the action of nicotine upon dogs is much more uncertain and difficult of interpretation). We find that in the cat a small dose of nicotine (1 to 3 milligrams) temporarily abolishes the effect of stimulating the nerve-roots, whilst only slightly diminishing the effect of stimulating the splanchnics; this being the same result as that above described upon the dog. On the other hand, a large dose of nicotine (10 to 12 milligrams) entirely abolishes the effects of stimulating both the nerve-roots and the splanchnics, whilst the nerves which pass to the spleen along with its blood-vessels are still freely excitable. It is clear, therefore, from the last result that large doses of nicotine cause a complete block between the splanchnics and the splenic nerves, *i.e.*, in the semilunar ganglion; so that there is, in all probability, a cell station in this ganglion for all the splenic fibres. On the other hand, as we have seen above, a block is apparently produced by small doses of nicotine between the nerve-roots and the splanchnics, *i.e.*, in the ganglia of the chain. Whether this is really due, as we have suggested in the text, to the existence of another cell-connection in these ganglia, or whether, as Mr. Langley has suggested to us, it is capable of another interpretation is a question which we propose to reserve for a detailed communication of our experiments in the 'Journal of Physiology,' and we will also defer until that communication reference to a paper by Bulgak on the innervation of the spleen, which appeared in Virchow's 'Archiv,' vol. 69, 1877, and which had escaped our attention.

II. "A Method for rapidly producing Diphtheria Antitoxines. Preliminary Note."\* By G. E. CARTWRIGHT WOOD, M.D., B.Sc. Communicated by Dr. PYE-SMITH, F.R.S. Received February 20, 1896.

The method for producing antitoxines, described in this preliminary communication, is the outcome of an investigation into the action of the products of the diphtheria bacillus on which I have been engaged

\* The investigation has been carried out in the laboratories of the Royal College of Physicians and Surgeons, and I should like here to express my great indebtedness to the Laboratories Committee for the facilities there afforded to me. I must also thank them and, through them, the Honourable Goldsmiths' Company, from whose Research Fund a grant was placed at my disposal.

*Curve of alterations in Spleen volume.*



*6<sup>th</sup> root  
left side.*

*6<sup>th</sup> root  
right side.*

*Time in seconds.*



*Tracing 1*

*Curve of alterations in Spleen volume.*



*10<sup>th</sup> root  
left side.*

*10<sup>th</sup> root  
right side.*

*Time in seconds*

*Tracing 2.*